

APPENDIX D

Land

Glacial Geology and Glossary

Geologic Formations

Wetlands

Lakes and Ponds

Mountains

Glacial Geology and Glossary

THE NATURE OF GLACIERS

Below are a few explanations that may help pull together some loose ends and clarify Acadia's story of glacial geology.

- A glacial cycle lasts approximately 100,000 years: 85,000 of which involves ice and 10-15,000 of which is interglacial. It has been suggested that we are approximately 10,000 years into an interglacial period. There is approximately 3-6 degree difference in temperature between the height of an ice age and the height of an interglacial period. (It is speculated that if there is a current greenhouse effect, the average temperature of the earth could be raised by 5 degrees centigrade. A discussion regarding ways in which the greenhouse effect might affect the environment in the next 2000, 5000, and 10,000 years could be interesting.)
- It is also estimated that there have been approximately 20-30 glacial advances in the past 2-3 million years. Land forms we see today are the cumulative effect of all glaciers.
- The ice thickness of the most recent glacier in the area of Acadia is debated. Because Mount Desert Island was near the edge of the ice sheet, ice thickness is noted to be thinner. It has been suggested that ice may have been at least 200 feet (62 m) thick on Cadillac Mountain, and it has also been suggested that ice was 3000 feet (925 m) on Cadillac Mountain. Some geologists speculate that there may never have been ice as thick as 9000 feet (2770 m) anywhere in the United States. Arguments, however, are for thinner ice everywhere on the North American continent.
- Land may have been compressed one foot for every three feet of ice pushing down on it. This and glacial melting account for the shoreline features at elevations approximately 220 feet above present sea level. As the earth's crust was freed from the ice burden, it began to rebound. Today, sea level continues to rise at a suggested rate of 2 inches (5 cm) per century.

THE CHANGING FACE OF ACADIA

- 20,000 years ago: Rugged highlands running in an east-west direction on Mount Desert Island.
- 17,000 years ago: Huge tongues of ice invaded valleys, and eventually engulfed the mountains on the way to the sea.
- 15,000 years ago: Acadia's ice sheet reached its maximum. The sheet extended 150-200 miles (240 km - 320 km) seaward to the edge of the continental shelf.
- 13,500 years ago: Climatic warming caused ice to melt back to the north. Ocean waters rose, flooding the foothills of Mt. Desert Island.
- 10,000 years ago: The ice changed the shape of Acadia. It cut deep U-shaped valleys running north-south, and rounded and polished the mountain tops.

PARTIAL GLOSSARY OF TERMS

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A complete glossary of geologic terms can be found in *The Geology of Mount Desert Island: A Visitor's Guide to the Geology of Acadia National Park*. This book is available from the Acadia Teacher Resource Library.

Abrasion: The grinding or wearing away of rock surfaces caused by the scraping action of rock fragments frozen into the base of a glacier.

Alpine Glacier: A medium to small glacier that forms in a mountain range and flows down valleys.

Chatter Marks: Arc-shaped fractures produced by pressure of glacial ice on boulders embedded in the base of the glacier.

Continental Glacier: A glacial ice sheet of considerable thickness which covers a sizeable portion of a continent and obscures most of the underlying terrain. The modern Antarctic ice sheet is a good example.

End Moraine: Ridges made of sand, gravel, and/or silt and clay that formed at the margin of a glacier.

Erratic: A glacially-transported rock that has been deposited some distance away from its point of origin and now rests on bedrock of a different type.

Rebound: The rise of the earth's crust in response to the removal of substantial thickness (and weight) of ice.

Striations: Parallel grooves on bedrock surfaces produced by the abrasive action of rock fragments frozen in the base of an actively moving glacier.

Geologic Formations

The principal bedrock formations on Mount Desert Island include:

Granite: the primary igneous rock of Acadia National Park's mountains formed from magma plugs embedded deep in the country rock beneath the surface of the Earth during the collision of tectonic plates nearly 400 million years ago. As plugs solidified different minerals formed (like feldspar, hornblende); later intrusions of quartz, feldspar, hornblende, and other minerals occurred in granite's cracks and crevices after plugs solidified.

Ellsworth Schist: the oldest rock exposed on Mount Desert Island (seen, for example, at Thompson Island), a gray layered rock laid down as mud on the sea floor over 500 million years ago, then heated during the collision of tectonic plates and altered to its current form. It is metamorphic.

Bar Harbor Formation: another sedimentary rock formation, originally laid down as silt and sand under the sea, then transformed by heat and pressure into the rocks we see today along the Shore Path in Bar Harbor.

Gabbro-diorite: rich in iron, magnesium, and calcium, gabbro and diorite are two different rocks often associated together. Older than granite, gabbro-diorite formations intruded into the country rock as granite did later. This rock can be seen along Route 3 west of Salisbury Cove and on Great Head in Acadia National Park.

Cranberry Island Series: originating in volcanic eruptions that deposited light gray and blue-gray layers of debris that settled on the sea floor. An example of an extrusive igneous rock.

Shatter Zone: a mixture of older rock in a matrix of granite, seen on Otter Point or at the eastern end of Sand Beach in Acadia National Park.

Diabase Dikes: fine-grained black rock forced upward through fractures in older formations. Diabase, basalt, and gabbro are similar in composition but formed differently, basalt erupting onto the surface, diabase cooling underground, and gabbros lying deeper still. Many of the hiking trails in Acadia National Park cross diabase dikes that are only a few inches to many feet wide. Dikes are particularly prominent in the granite at Schoodic Point.

APPENDIX D – LAND

Wetlands

Reflecting their need for water during the growing season, certain species of plants serve as indicators to the availability of water in the freshwater wetlands in which they thrive.

Indicator Species in Acadia's Freshwater Wetlands

Permanently Flooded Wetlands: white water lily, spatterdock, pondweeds, floating heart

Semi-permanently Flooded Wetlands: bur reeds, bayonet rush, pickerelweed, common arrowhead, common pipewort

Seasonally Flooded Wetlands: cattail, tussock sedge, marsh fern, mountain holly, wild raisin, red maple

Wetlands with Seasonally Saturated Soils: pitcher plant, white beak rush, leather leaf, sphagnum moss

Freshwater wetlands provide habitat for three groups of plants and wildlife:

(1) upland species that can tolerate wetland conditions including white pine, white-tailed deer, garter snakes, as well as frog and salamander species that breed in flooded wetlands in spring; (2) aquatic species including mummichogs, snapping turtles, otters, and water striders that can survive in wetland pools; and (3) species that live predominantly in wetlands including cattails, muskrat, beaver, and pickerel frogs.

APPENDIX D – LAND

Lakes and Ponds

MAXIMUM DEPTH

Sargent Pond – 14’

The Bowl – 29’

Bubble Pond – 39’

Eagle Lake – 110’

Jordan Pond – 150’

Lower Breakneck Pond – 21’

Upper Breakneck Pond – 12’

Upper Hadlock Pond – 37’

Aunt Betty Pond – 7’

Lower Hadlock Pond – 40’

Witch Hole Pond – 33’

Beaver Dam Pond – 13’

The Tarn – 5’

Echo Lake – 66’

Round Pond – 19’

Long Pond – 113’

Hodgdon Pond – 22’

Seal Cove Pond – 44’

Lake Wood – 11’

Halfmoon – 20’

Great Ponds (10 acres or larger) within Acadia National Park are: Aunt Betty, Bubble, Eagle, Jordan, Lower Hadlock, Upper Hadlock, Witch Hole, Round Pond, Lake Wood. Great Ponds bordering Acadia National Park are: Echo, Hodgdon, Seal Cove, Long (Mount Desert Island) and Long (Isle au Haut).

The park has established a long-term water monitoring program for freshwater resources focusing on impacts from atmospheric deposition and cultural eutrophication.

APPENDIX D – LAND

Mountains

There are 26 mountains in Acadia National Park:

Cadillac (formerly Green) – 1,530’

Sargent – 1,373’

Dorr (formerly Flying Squadron and Dry) – 1,270’

Pemetic – 1,248’

Penobscot (formerly Jordan) – 1,194’

Bernard of Western – 1,071’

Champlain (formerly Newport) – 1,058’

Gilmore – 1,036’

Bald – 974’

Mansell of Western – 949’

Cedar Swamp – 942’

Parkman (formerly Little Brown) – 941’

North Bubble – 872’

Norumbega (formerly Brown) – 852’

Beech – 839’

South Bubble – 766’

Huguenot Head (formerly Picket) – 731’

McFarland – 724’

The Triad – 698’

Acadia (formerly Robinson) – 681’

Youngs – 680’

St. Sauveur (formerly Dog) – 679’

Day – 580’

Gorham – 525’

The Beehive – 520’

Flying – 284’

From October 7 to March 6 Cadillac Mountain is the first place in the United States where you can see the sun rise. Cadillac Mountain is the only mountain in Acadia National Park with an auto road to the summit.